Amdt # 8|A

11/8/04
B. Ross

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Serial No. 10/075,172
Confirmation No. 7318
Filing Date ..... February 13, 2002
Inventor.....B. E. Cron
Assignee.....Micron Technology, Inc.
Group Art Unit.....3723
Examiner ..... Eziamara Anthony Ojini
Attorney's Docket No. MI22-1804
Customer No. 021567
Title: Methods for Conditioning Surfaces of Polishing Pads After Chemical-Mechanical Polishing

RESPONSE TO NOVEMBER 19, 2003 OFFICE ACTION

To: Commissioner for Patents
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AMENDMENTS

In the Specification

No changes.

In the Claims

Claim 1 (original): A method for conditioning a surface of a polishing pad after chemical-mechanical polishing of a semiconductor substrate with the pad surface, comprising exposing the pad surface to steam.

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Claim 2 (original): The method of claim 1 wherein the steam is jetted onto the pad surface to impact the surface with a pressure of from about 10 psig to about 20 psig.

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Claim 3 (original): The method of claim 1 wherein the steam has a temperature of at least about 200°F as it impacts the surface.

Claim 4 (original): The method of claim 1 wherein the steam is jetted onto the pad surface from a head which is displaced relative to the pad surface during the exposure of the pad surface to the steam.

Claim 5 (original): The method of claim 1 wherein the pad has a contaminant associated therewith prior to the conditioning, and wherein a chemical agent suitable for reacting with the contaminant is within the steam during the exposure of the pad surface to the steam.

Claim 6 (original): The method of claim 1 wherein ammonium is within the steam during the exposure of the pad surface to the steam.

Claim 7 (original): The method of claim 1 wherein ammonium citrate is within the steam during the exposure of the pad surface to the steam.

Cont B1

Claim 8 (original): The method of claim 1 wherein the chemical-mechanical polishing utilizes the pad to polish a copper-containing material; and wherein ammonium is within the steam during the exposure of the pad surface to the steam.

Claim 9 (original): The method of claim 1 wherein the pad is rubbed against a conditioning stone during the exposure to the steam.

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Claim 10 (original): The method of claim 1 wherein the pad is rubbed against a conditioning stone prior to the exposure to the steam.

Claim 11 (original): The method of claim 1 wherein the pad is rubbed against a conditioning stone after the exposure to the steam.

Claims 12-35 (canceled).

REMARKS

Claims 12-35 have been cancelled from the application, and claims 1-11 remain pending in the application.

The pending claims stand rejected as being unpatentable over Lofaro, either alone, or in combination with Nishimura or Brunelli. Applicant respectfully requests reconsideration of such rejections.

Referring first to claim 1, such recites a method for conditioning a surface of a polishing pad after chemical-mechanical polishing of a semiconductor substrate with the pad surface. The claim recites that such conditioning comprises exposure of the pad surface to steam.

The Examiner contends that claim 1 is anticipated by Lofaro and notes that Lofaro refers to a two-phase solid-gaseous "steam" at column 4, lines 6-11. Applicant respectfully submits that Lofaro's utilization of the term "steam" is a typographical error. The two-phase solid-gaseous material referred to by Lofaro at column 4, lines 6-11 is described throughout Lofaro as being a two-phase "stream" of dry ice particles within liquid carbon dioxide. The Examiner is referred to, for example, the abstract of Lofaro (wherein Lofaro refers to a "stream" of cryogenic pellets, column 4, line 16 (where Lofaro refers to a cryogenic pellet-gas "stream"), and the remainder of the Lofaro document. In fact, a search for the term "steam" in Lofaro reveals that such term is utilized only once in the reference, and that the two-phase material of Lofaro is otherwise always referred to as a "stream". Further, from the context of Lofaro it is clear that Lofaro is not talking about a "steam" as it would be non-

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sensicle to refer to the two-phase material of Lofaro as a "steam". Specifically, the term "steam" is understood by a person of ordinary skill in the art to refer to a vapor phase, and the material described in Lofaro at column 4, lines 6-11 is specifically described as having a solid phase within a liquid phase, and thus is not a "steam".

For the above-described reasons, Lofaro does not disclose or suggest the claim 1 recited exposure of a pad surface to steam. Claim 1 is therefore not anticipated by Lofaro, or rendered obvious by Lofaro.

Claims 2 and 4-8 are rejected by the Examiner as being either anticipated by Lofaro, or as being obvious over Lofaro alone. Claims 2 and 4-8 depend from claim 1, and are therefore allowable over Lofaro for at least the reasons discussed above regarding claim 1, as well as for their own recited features which are neither shown nor suggested by Lofaro. Applicant therefore requests allowance of claims 2 and 4-8 in the Examiner's next action.

Claim 3 stands rejected as being unpatentable over Lofaro in view of Nishimura. Claim 3 depends from claim 1 and recites that the steam of claim 1 has a temperature of at least about 200°F as it impacts the pad surface. The Examiner recognizes that Lofaro does not disclose that the two-phase material described therein (the material which the Examiner erroneously refers to as a "steam", but which Lofaro generally refers to as a "stream") is utilized at a temperature of at least about 200°F. In fact, Lofaro describes utilization of temperatures of from about -150°F to about -25°F (see, for example, column 4, lines 45-54), presumably because Lofaro wants to maintain solid carbon dioxide in the two-phase stream described therein. The Examiner notes that Nishimura describes utilization of a temperature of at least about 200°F, and contends that it would be obvious

to utilize the two-phase stream of Lofaro at the temperature of at least about 200°F. The Examiner is mistaken. Utilization of a temperature of at least about 200°F would destroy Lofaro's intended purpose of forming a two-phase stream comprising liquid carbon dioxide and solid carbon dioxide. For at least this reason, it is not obvious to utilize Lofaro's disclosed two-phase stream at a temperature of at least about 200°F. Claim 3 is allowable for this additional reason, as well as for the reasons discussed above regarding claim 1. Applicant therefore requests formal allowance of claim 3 in the Examiner's next action.

Referring next to claims 9-11, such stand rejected as being unpatentable over Lofaro in view of Brunelli. Claims 9-11 depend from claim 1, and further recite that the exposure to the steam occurs in a particular order relative to rubbing of the claim 1 recited pad against a conditioning stone. The Examiner contends that Brunelli shows that a surface of a polishing pad can be rubbed against a conditioning stone during, prior or after exposure to a steam, and refers the applicant to Fig. 4 of Brunelli. Applicant respectfully submits that Brunelli does not disclose or suggest any utilization of steam during conditioning of a polishing pad surface. Accordingly, Brunelli does not disclose or suggest any particular order with which a polishing pad surface would be exposed to steam and also exposed to a conditioning stone. Accordingly, the combination of Brunelli with Lofaro does not disclose or suggest the subject matter of claims 9-11.

Claims 1-11 are allowable for the reasons discussed above, and applicant therefore requests formal allowance of claims 1-11 in the Examiner's next action.

Respectfully submitted,

Dated: February 5, 2004 By: _____

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